

22/11/2014

# Emission Spectra

## *Learning Objectives*

1. Explain why atoms emit light of different wavelengths

22/11/2014

## Bohr's Atomic Model

Lowest Energy Level  
(ground state)

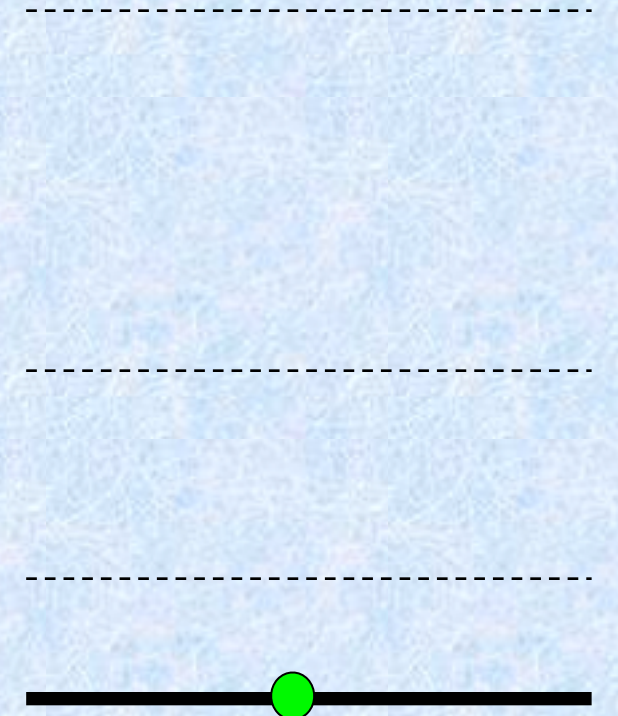
Electron (ground state)

higher energy levels

Nucleus

Electrons 'live' in specific energy levels.

An electron will move up to a higher energy level if it is given energy (heat, light and electricity).



The energy levels can be shown on a diagram like this

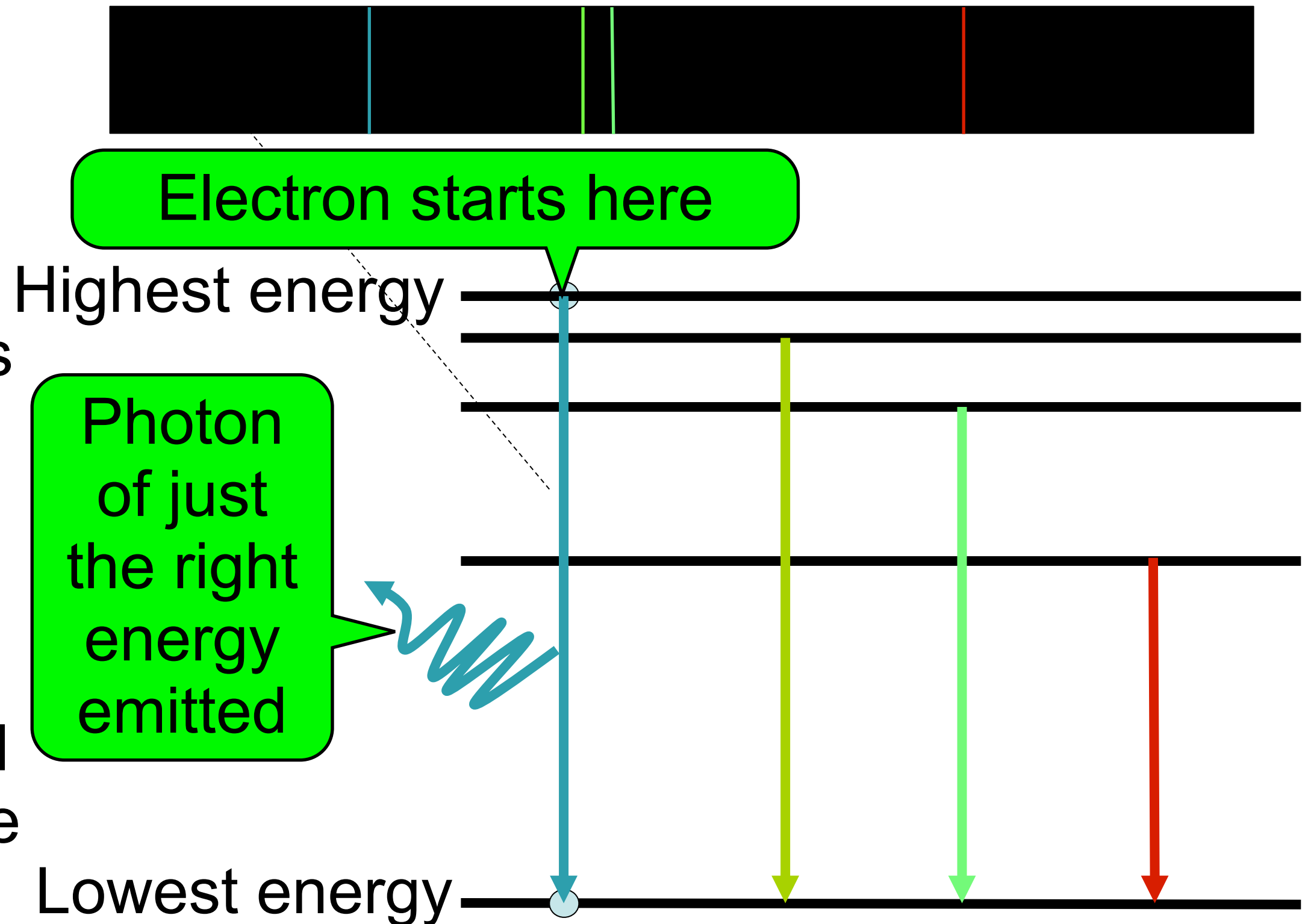
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## Emission Spectra - Hydrogen

An electron will move down to a lower energy level if it loses energy.

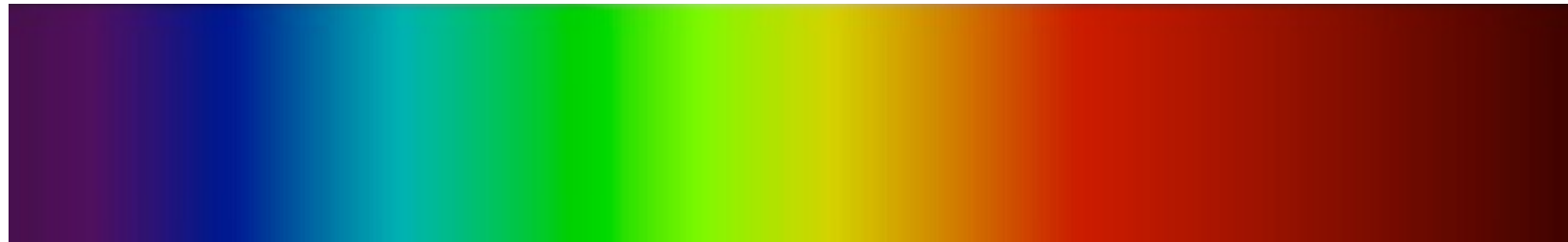
Electrons inside atoms can only have fixed levels of energy *i.e.* they are **quantised**.

The 'ladder' of allowed energy levels is unique to each element.

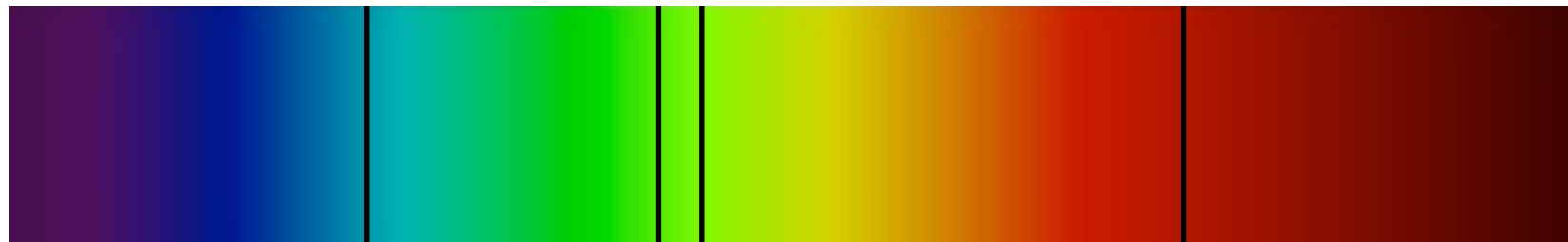


22/11/2014

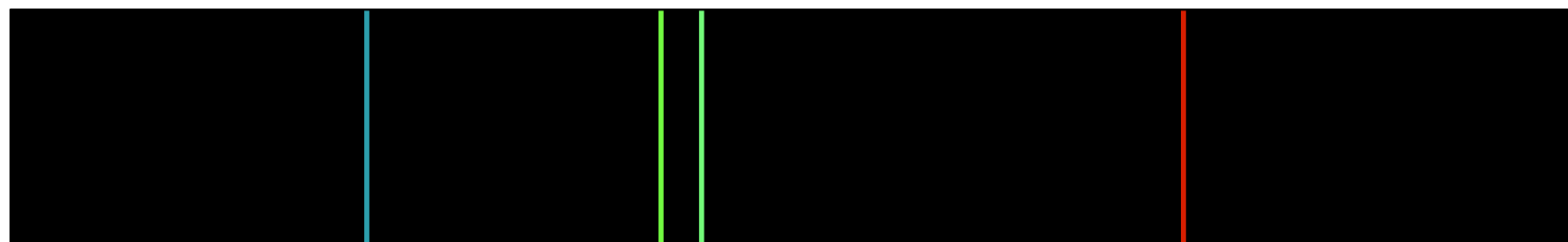
## Main - Spectra



Continuous Spectrum: no gaps



Absorption spectrum: some wavelengths have been absorbed



Emission spectrum: some wavelengths are emitted



## Practical - Atomic Spectra

1. Pour roughly 20ml of Hydrochloric Acid into the glass beaker.
2. Clean the wire rod in the acid.
3. Wash the wire rod with water and dry it.
4. Dip the wire rod in a salt sample and burn it in a blue flame.
5. Record the colour and repeat steps 1 - 4 with another salt.



22/11/2014

## Salts for the Practical

Chlorides	Chlorides	Nitrates	Nitrates	Sulphates
NaCl	AlCl <sub>3</sub>	Cu(NO <sub>3</sub> ) <sub>2</sub>	KNO <sub>3</sub>	MgSO <sub>4</sub>
SnCl <sub>2</sub>	ZnCl <sub>2</sub>	Zn(NO <sub>3</sub> ) <sub>2</sub>	Sr(NO <sub>3</sub> ) <sub>2</sub>	CuSO <sub>4</sub>
KCl	CaCl <sub>2</sub>	NaNO <sub>3</sub>	Ba(NO <sub>3</sub> ) <sub>2</sub>	FeSO <sub>4</sub>
CoCl <sub>2</sub>	FeCl <sub>3</sub>	Al(NO <sub>3</sub> ) <sub>3</sub>	Pb(NO <sub>3</sub> ) <sub>2</sub>	Ce(SO <sub>4</sub> ) <sub>2</sub>
CsCl	FeCl <sub>2</sub>	Mg(NO <sub>3</sub> ) <sub>3</sub>	Ca(NO <sub>3</sub> ) <sub>2</sub>	
MgCl <sub>2</sub>	LiCl	Fe(NO <sub>3</sub> ) <sub>3</sub>		
SrCl <sub>2</sub>	CrCl <sub>3</sub>	NH <sub>4</sub> NO <sub>3</sub>		
CuCl <sub>2</sub>	BaCl <sub>2</sub>	Co(NO <sub>3</sub> ) <sub>2</sub>		

# Investigation - Emission Spectra

1. Aim/Research Question - Describe what you are going to investigate include the independent and dependent variables.
2. Hypothesis - Outline your prediction and explain why you think that using scientific reasoning.
3. Variables - Write the variables and outline how to manipulate them.
  - Independent Variable - What you change.
  - Dependent Variable - What you measure.
  - Controlled Variables - What you keep the same.
4. Materials - Write a list of all the materials and equipment you used. Be specific e.g. 250 cm<sup>3</sup> beaker.

# Investigation - Emission Spectra

5. Method - Design a logical, safe and complete method. Write the method as a list of commands.

Remember to outline how to manipulate the variables and to describe how to collect sufficient data.

6. Results - Make a table for your results don't forget the titles and to include pictures.

Name of Salt	Formula of Salt	Observation	Photo	Spectra



# Investigation - Emission Spectra

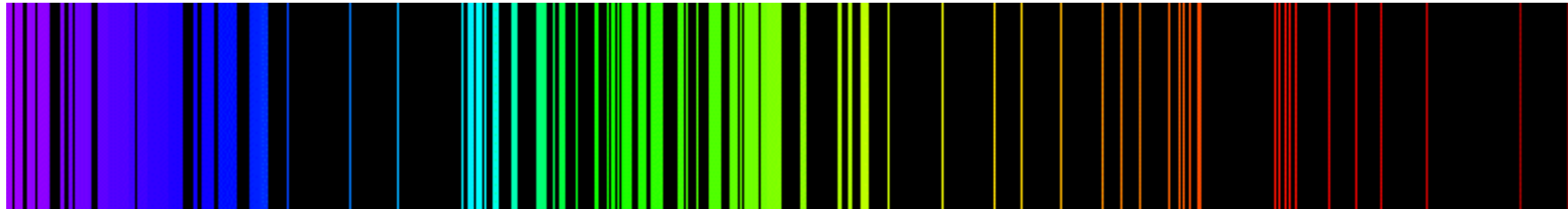
## 7. Conclusion

- Outline the results (What happened?).
- Interpret the results using scientific reasoning (Explain what happened).

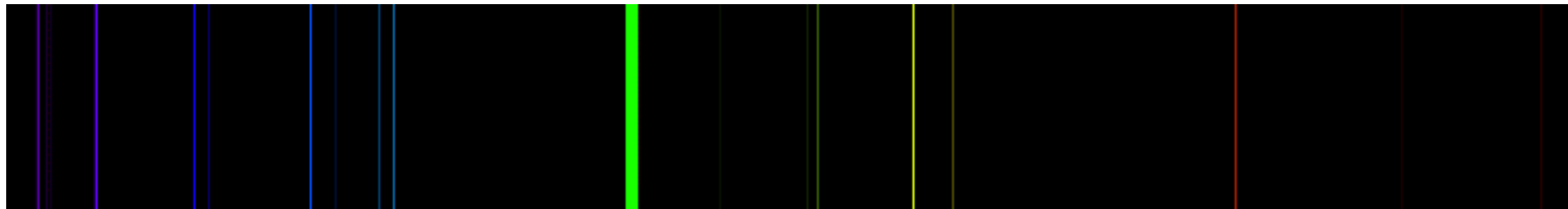
## 8. Evaluation

- Discuss the validity of your prediction (How confident are you of the hypothesis? Did you collect enough data to prove it?).
- Discuss the validity of the method (Did you control all of the variables accurately?).
- Describe how you could improve the experiment.
- Describe extensions you could do (further investigations).

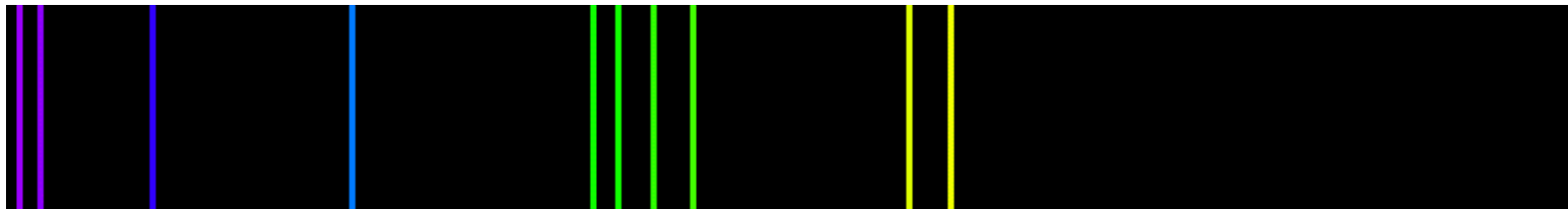
# Investigation - Emission Spectra



Fe



Mg



Cu

<http://chemistry.bd.psu.edu/jircitano/periodic4.html>

# Test Topics

1. Dalton - indivisible/indestructable atoms
2. J.J. Thompson - electron discovery/experiment
3. Rutherford - nucleus discovery/gold leaf experiment
4. Bohr - Orbitals (Shells) Energy Levels/Emission spectra
5. Light - wavelength energy relationship/photons

## Test Help

7.b) Describe the relationship between wavelength and frequency. [1]  
Describe the relationship between wavelength and energy. [1]

